CLAIMS

1. A solid supported catalyst for the polymerization of conjugated dienes, comprising a reaction product of

a. a complex represented by formula $M(Ar)(AlX_4)_3$, where M is a rare earth metal selected from among the metals having an atomic number of between 57 and 71 in Mendeleyev's periodic table of elements, Ar is an aromatic hydrocarbon solvent, Al is aluminum and X is a halogen atom selected from among fluorine, chlorine, bromine and iodine, and

b. a solid support comprising an inorganic metal oxide compound.

2. The solid supported catalyst according to Claim 1, wherein the solid support comprises silica.

3. The solid supported catalyst according to Claim 1 or 2, further comprising a compound represented by formula $AlXnR_{3-n}$, where Al is an aluminum atom, X is a halogen atom, selected from among fluorine, chlorine, bromine and iodine, R is a hydrogen atom or an alkyl group having from 1 to 15 carbon atoms and n is an integer ranging from 0 to 3.

4. The solid supported catalyst according to Claim 3, wherein AlX_nR_{3-n} is triethylaluminum, triisobutylaluminum or diethylaluminum chloride.

5. The solid supported catalyst according to Claim 1 wherein the rare earth metal M is neodymium.

6. The solid supported catalyst according to Claim 1 or 3 wherein halogen X is chlorine.

7. The solid supported catalyst according to Claim 1 wherein the solid support comprises the reaction product of an inorganic metal oxide compound with a Lewis acid of the formula $M'X_n$, where n is an integer ranging from 3 to 5, X represents a halogen atom, selected from among fluorine, chlorine, bromine and iodine and M' is a metal, the atomic number Z of which complies with either of the following two conditions:

$Z \in \{5; 13; 22; 26; 40; 50; 51; 72\}$, or

Z ranging from 57 to 71.

8. The solid supported catalyst according to Claim 7 wherein metal M' is selected from the group consisting of boron, titanium, iron, aluminum, zirconium, tin, hafnium and antimony.

9. A process for the preparation of a solid supported catalyst comprising a reaction product of

a. a complex represented by formula M (Ar) (AlX_3), where M is a rare earth metal selected from among metals having an atomic number of between 57 and 71 in Mendeleyev's periodic table of elements, Ar is an aromatic hydrocarbon solvent and X is a halogen selected from among florine, clorine, bromine and iodine, and

b. a solid support comprising an inorganic metal oxide compound,

said processing comprising

(i) preparing said solid support,

(ii) preparing said complex of formula $M(Ar)(AlX_4)_3$ by reacting, in solvent Ar, a halide of rare earth metal M, represented by the formula MX_3, and a halide of aluminum, represented by the formula AlX_3, wherein MX_3 and AlX_3 contain the same halogen X, and

(iii) reacting said complex with said solid support to obtain said catalyst.

10. The process according to Claim 9, wherein the molar ratio AlX_3:MX_3 is greater than or equal to 3.

11. The process according to Claim 10, wherein the molar ratio is between 4 and 7.

12. A process for the preparation of a solid supported catalyst, comprising a reaction product of

a. a complex represented by formula M (Ar) (AlX_3), where M is a rare earth metal selected from among metals having an atomic number of between 57 and 71 in Mendeleyev's periodic table of elements, Ar is an aromatic hydrocarbon solvent and X is a halogen selected from among florine, clorine, bromine and iodine and

b. a solid support comprising an inorganic metal oxide compound,

said process comprising

(i) reacting the solid support in the aromatic hydrocarbon solvent Ar with an excess of an aluminum halide represented by formula AlX_3 and

(ii) reacting the product of (i) with a halide of the rare earth metal represented by the formula MX_3, wherein AlX_3 and MX_3 contain the same halogen X, in order to form the catalyst comprising complex $M(Ar)(AlX_4)_3$.

13. A process for the preparation of a solid supported catalyst comprising the reaction product of

a. a complex represented by formula M (Ar) (Al X_3), where M is a rare earth metal selected from among metals having an atomic number of between 57 and 71 in Mendeleyev's periodic table of elements, Ar is an aromatic hydrocarbon solvent and X is a halogen selected from among florine, clorine, bromine and iodine, and

b. a solid support comprising an inorganic metal oxide compound, said processing comprising concomitantly reacting, in the aromatic hydrocarbon solvent Ar, said solid support with an excess of aluminum halide AlX_3, and a halide of rare earth metal represented by the formula MX_3, wherein AlX_3 and MX_3 contain the same halogen X, in order to form the catalyst comprising complex $M(Ar)(AlX_4)_3$.

14. The process according to one of Claims 9 to 13, further comprising reacting said catalyst with a compound represented by formula AlX_nR_{3-n}, where Al is an aluminum atom, X is a halogen atom, selected from among fluorine, chlorine, bromine and iodine, R is a hydrogen atom or an alkyl group having from 1 to 15 carbon atoms and n is an integer which may range from 0 to 3.

15. The process according to Claim 14, wherein AlX_nR_{3-n}. is triethylaluminum, triisobutylaluminum or diethylaluminum chloride.

16. The process according to one of Claims 9, 12 and 13, further comprising dehydrating said inorganic metal oxide compound and then partially dehydroxylating said compound by heat treatment at a temperature of between 300 °C and 800 °C.

17. The process according to one of Claims 9, 12 and 13 wherein the solid support comprises the reaction product of an inorganic metal oxide compound with a Lewis acid of the formula $M'X_n$, where n is an integer ranging from 3 to 5, X represents a halogen atom, selected form among fluorine, chlorine, bromine and iodine and M' is a metal, the atomic number Z of which complies with either of the following two conditions:

$Z \in \{5; 13; 22; 26; 40; 50; 51; 72\}$, or

Z ranging from 57 to 71.

18. The process according to Claim 17, wherein said metal M' is selected from the group consisting of boron, titanium, iron, aluminum, zirconium, tin, hafnium or antimony.

19. The process according to Claim 17, further comprising reacting said Lewis acid of formula $M'X_n$ in the solid state and in excess with said inorganic metal oxide compound and subliming said acid.

20. The process according to Claim 17, wherein said Lewis acid of formula $M'X_n$ is reacted in solution in an inert hydrocarbon solvent with said inorganic metal oxide compound.

21. A process for polymerizing a configurated diene in an inert hydrocarbon solvent comprising reacting in the presence of an activator compound with a solid supported catalyst comprising a reaction product of

a. a complex represented by formula M (Ar (Al X_4), where M is a rare earth metal selected from among metals having an atomic number of between 57 and M in Mendeleyev's periodic table of elements, Ar is an aromatic hydrocarbon solvent and X is a halogen selected from among florine, clorine, bromine and iodine, and

b. a solid support comprising an inorganic metal oxide compound.

22. The process according to Claim 21, wherein the conjugated diene is 1,3-butadiene and/or isoprene.

23. The process according to Claim 21 wherein the activator compound is a trialkylaluminum hydride or a dialkylaluminum hydride.